On the Concept of Postural Muscles and Posture in Man

Basic human posture should be derived from the principal movement pattern, namely gait. Since we stand on one leg for most of the time during walking, the stance on one leg should be considered to be the typical posture in man; the postural muscles are those which maintain this posture.

VLADIMIR JANDA

Professor Vladimir Janda is the Director of the Department of Rehabilitation Medicine, Charles University Hospital, Prague, Czechoslovakia, and holds the Chair of Rehabilitation Medicine at the Postgraduate Medical School, Prague. During August and September, 1982, Professor Janda was a Visiting Professor in the Department of Physiotherapy, University of Queensland

Even with the better understanding of the clinical problems of the human motor system which we have today, misunderstandings can still arise. Indeed, they can occur to such a degree that there can be a lack of understanding both between medical practitioners and between medical practitioners and physiologists. These misconceptions and discrepancies are evident even in the explanation of such principal functions of the motor system as gait, standing or sitting A good example of such confusion exists in the use of the term 'postural muscles'. This term is used by different authors in substantially different ways. In principle, the 'postural muscles' in 'postural function' are related to posture However, there is a wide range of opinions concerning the typical posture in man.

Most authors consider postural muscles as being those which maintain erect standing in man. It is often forgotten however, that under ideal physiological situations, the erect standing position is so well balanced that little or no activity is necessary to maintain it. When activity does occur to a small degree, it does so irregularly. Thus there is a dilemma: we consider as postural muscles those which maintain erect standing, but for maintaining erect standing no muscle activity is needed Basmajian (1962) noticed this paradox and tried to solve it. According to him, in the narrowest and most limited sense, posture may be considered to be the upright, well-balanced stance of the human subject in a 'normal' position In this sense, the subject of posture would deal only with the maintenance of the erect person's position against the force of gravity. But a broader, more generous and more palatable definition would not exclude the standing, sitting and reclining positions which human beings assume in their constant battle against the force of gravity

Roaf (1977) preferred to define posture as 'the position the body assumes in preparation for the next movement. Mere uprightness which is static, is not true posture' This citation of some opinions shows that the concept of posture is vague, and full of confusion and that in principle, typical posture is understood as something which is more or less apart from the general function of the motor system. Posture is considered mainly as a static function rather than being related to general mobility.

Another complication in the concept of postural muscles is the system of axial and acral muscles, which form two independent systems The axial muscles have a predominantly postural character This differentiation has its anatomico-physiological background for instance in the paleo and neocerebellar system and in the descending corticospinal tracts of the so-called medial and lateral system

If a muscle behaves as a postural or phasic muscle, it will certainly depend not only on the type of innervation and other properties of the muscle, but will also be an expression of adaptation There is no reason to doubt that human muscles will behave in a manner similar to that demonstrated for the pectoralis muscle in birds In migrating birds, in which there is a greater demand for endurance, the muscle has all the properties of a postural muscle, whereas in birds which have to fly short distances quickly, this muscle is phasic (Denny-Brown 1929).

It may be presumed however, that the limitation of postural muscles exclusively to erect standing is, at least from the clinical point of view, incorrect. The basic and primary function of the motor system is 'motion' and all static functions should be derived from this basic kinetic or dynamic performance. Therefore the question should be raised in an opposite way: not 'what is the basic posture of man?' but 'what is the basic movement pattern?' and from this, the statics should be derived At best, this was expressed by Sherrington (1906) in his words 'posture follows movement like a shadow'.

It has generally been accepted that locomotion for the lower extremity and prehension for the upper extremity present the basic reflex movement patterns This corresponds exactly to

morphological (Benninghoff 1944) as well as physiological (Gellhorn 1950) findings. These patterns are used widely as one of the basic physiotherapeutic approaches. Thus gait can be considered as the principle movement pattern.

In analysing the gait pattern, one should not forget that during a step we stand, depending on the speed, at least 85 per cent of the cycle on one leg, whereas only about 15 per cent is spent on two legs. Thus the longest period of the gait cycle is spent on one leg. The period we stand on two legs is substantially briefer and even then we stand on a rather narrow base. The basic effort of the body is therefore to battle against the force of gravity while standing on one leg. As gait is the principal pattern of the static functions, posture should be derived from it. Additionally, balanced standing on two legs is very unpleasant and tiring. Normally, after a while, we transfer the weight of the body to one leg using the other for support only.

From these points it may be assumed that the term 'postural' or 'anti-gravity' muscles should not describe muscles which maintain erect stance on two legs, as is common practice in clinical language. Rather, when referring to muscles which have a dominant postural function, we should consider those whose activity is necessary to maintain erect posture in standing on one leg only.

The muscles which maintain erect posture in standing on one leg are exactly those which show a striking tendency to get tight (Janda 1967). The same muscles usually show the greatest degree of spasticity in the capsular type of hemiplegia (Janda 1977).

It is to be hoped that these arguments are strong enough to convince that standing on one leg should be considered as the most typical posture in man. And at least for clinical reasons, only those muscles which are responsible for maintenence of this posture should be described as postural. This concept simultaneously avoids some discrepancies concerning, for example, the postural function of gluteal muscles in comparison to the tensor fasciae latae or to thigh adductors (Inman 1947, Waghemacker, Dumoulin and Spy 1963).

This view should be considered in preparing the therapeutic exercise programme to improve faulty posture and postural defects in general.

References

Basmajian TV (1962), *Muscles Alive*, Williams & Wilkins Co , Baltimore

Benninghoff A (1944), *Lehrbuch der Anatomie des Menschen*, Lehmanns Velag, Munchen

Denny-Brown D (1929), The histological features of striped muscle in relation to its functioned anatomy, *Proceedings of the Royal Society of London*, **104** B, 371-411 cited by JF Fulton (1943), *Physiology of the nervous system*, 2nd edition, Oxford University Press, New York, Chapter 7, p110

Gellhorn E (1958), The physiological basis of neuromuscular relaxation, *Archives of Internal Medicine*, **102**, 392-399

Inman VT (1947), Functional aspects of the abductor muscles of the hip, *Journal of Bone and Joint Surgery*, **29A**, 607-619

Janda V (1967), Die Motorik als reflektorisches Geschehen und ihre Bedeutfung in der Pathogenese der Fehlhaltung, *Physical Medicine and Rehabilitation*, **8**, 11

Janda V (1977), Comparison of muscle tone in spastic conditions of cerebral origin and postural defects, *Rehabilitation* 14-15, 87-88 Proceedings

Roaf, R (1978), *Posture*, Academic Press, London

Waghemacker R, Dumoulin J and Spy E (1963), Le facteur musculaire dans la coxarthrose, *Annales Médicine Physique*, 6(4), 263-327